EMC TEST REPORT
No. 1920 FR

Issue#2: 29th July 2020

FCC Part 15C,
Industry Canada
Certification Report

for

Magicard K

Card Printer

FCC ID: XDW4500-0001

Project Engineer: R. Pennell

Approval Signatory

Approved signatories: D. Tiroke ☐ A. Coombes ☑

The above named are authorised Eurofins Hursley sigantories.

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Document History:

Issue#1: 10th June 2020 was withdrawn and replaced by Issue#2: 29th July 2020 updated with editorial correction.

1.0 DECLARATION

1.1 FCC Part 15C Statement and Industry Canada (IC) Statement

The Equipment Under Test (EUT), as described and reported within this document, complies with ISED RSS-Gen Issue 5 March 2019 and IC RSS-210 Issue 10 December 2019 and the parts 15.207, 15.209, 15.225 of the CFR 47:2015 FCC rules. The EUT operates at frequencies of 13.56 MHz and complies with part 15C emission requirements.

For emissions outside the 13.110 – 14.010MHz band the EUT, as described and reported within this document, complies with the parts 15.207 and 15.209 of the CFR 47 FCC rules in accordance with ANSI C63.10:2013 and ANSI C63.4:2014.

1.2 Related Submittal(s) Grants

This is an application for certification of a Magicard K card (transmitting at 13.56 MHz), described in this report.

The sections of FCC Part 15 that apply to the EUT are:
15.207 Conducted emissions intentional radiator
15.209 Radiated emissions intentional radiator
15.225 Operation within the band 13.110 to 14.010 MHz

1.3 EUT Manufacturer

Trade name:	Magicard Ltd
Company name:	Magicard Ltd
Company address:	Magicard Ltd
	Waverley House
	Hampshire Road
	Weymouth
	Dorset
	DT4 9XD
Manufacturing address:	As above.
Company representative:	Timothy Last
	Tel: +44 (0) 1305 470 263

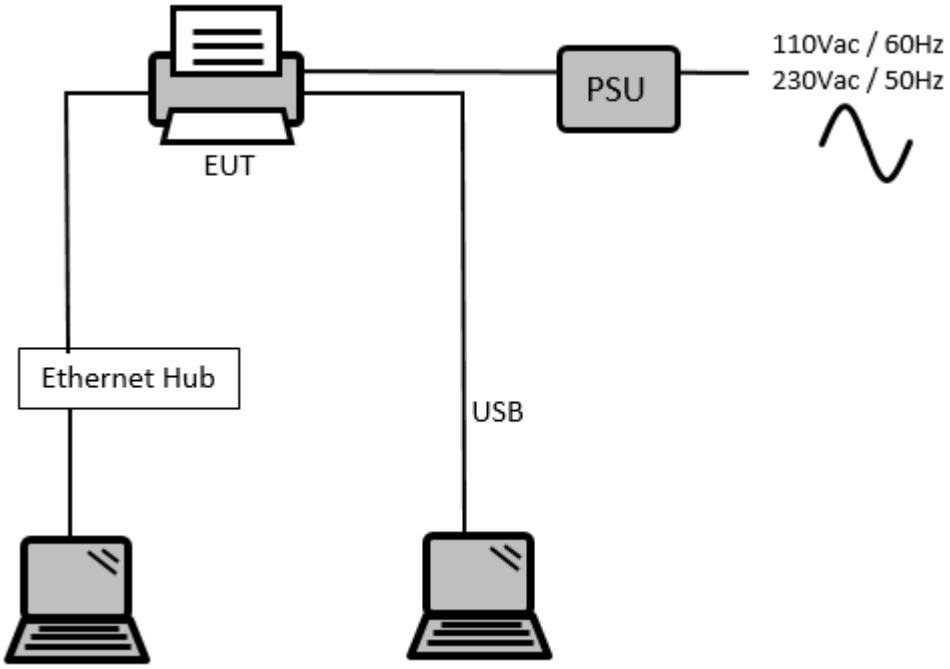
2.0 EUT DESCRIPTION

2.1 Product Information

EUT:	Magicard K card printer
Model Number:	4500-0024K
Serial numbers:	73461625
Sample build:	Production

2.2 Product Operation

The Magicard K card printer is a colour card printer. It utilises low power RFID technology for recognition of consumable print film. It operates at a transmit frequency of 13.56 MHz



2.3 Support Equipment

- Dell latitude 3570 laptop s/n: 7JK3ZB2
- Dell latitude D520 laptop s/n: GBHBJ2J
- TP-Link router s/n: 8779904967

2.4 Exerciser Program

Laptop running Windows printer driver

The EUT was set to print continuously for non-intentional radiator / general requirements.
The EUT RFID was set to transmit continuously at 13.56 MHz for intentional radiator tests.

3.0 MEASUREMENT PROCEDURE AND INSTRUMENTATION

3.1 EMI Site Address & Test Date

EMI Company Offices	Eurofins Hursley Trafalgar House, Trafalgar Close, Chandlers Ford, Hampshire
EMI Measurement Site	Eurofins Hursley UK Designation number: UK0006 Canada CAB Identifier: UK0005
Test Dates	10th to 16th March 2020
Eurofins Hursley Reference:	1920

3.2 General Operating Conditions

Testing was performed according to the procedures in accordance with ANSI C63.4:2014 and 63.10 2013. Final radiated testing was performed at a EUT to antenna distance of three metres. Instrumentation, including receiver and spectrum analyser bandwidth, comply with the requirements of ANSI C63.2:2009.

3.3 Uncertainty

The following measurement uncertainties have been calculated in accordance with ANSI C63.23, CISPR 16-4-2 and in line with other available guidance to provide a confidence level of 95% (coverage factor, k = 2) in the reported measurements:

For Conducted emissions:

	9 kHz – 150 kHz	150 kHz – 30 MHz
ULAB via AMN	± 3.28 dB	± 3.29dB

For radiated emissions below 1 GHz:

3 m measurement distance	30 MHz – 200 MHz	200 MHz – 1 GHz
Vertical polarisation	± 3.7 dB	± 5.1 dB
Horizontal polarisation	± 3.9 dB	± 3.8 dB

For radiated emissions below 1 GHz:

10 m measurement distance	30 MHz – 200 MHz	200 MHz – 1 GHz
Vertical polarisation	± 4.4 dB	± 4.8 dB
Horizontal polarisation	± 4.5dB	± 4.6 dB

For radiated emissions above 1 GHz:

3 m measurement distance	1 GHz – 6 GHz	6 GHz - 18 GHz	18 GHz – 40 GHz
Both polarisations	± 4.5 dB	± 4.4 dB	± 4.3 dB

3.4 Environmental Ambient

Test Type	Temperature	Humidity	Atmospheric Pressure
Emissions	20 to 21.7 degrees Celsius	34 to 55 % relative	1009.8 to 1025.3 millibars

3.5 Conducted Emissions

Test Configuration

A filtered 110V/60Hz supply was fed to the EUT via a 50Ω/50µH Line Impedance Stabilisation Network (LISN). The LISN was directly bonded to a conductive ground plane.

Test Measurement

The worst-case emissions were identified on both the neutral and phase(s) with an RF measurement receiver set to scan from 0.15 MHz to 30.0 MHz.

The worst-case peaks were then identified and measured using a quasi-peak detector and compared to the frequency range and limits of CISPR 22 as specified by ANSI C63.4-2014.

The worst-case results are presented in this report.

Test instrumentation used in the conducted test was as follows:

#ID	CP	Manufacturer	Type	Serial Nø	Description	Calibration due date
158	1	Rohde & Schwarz	ESH3-Z2	357881052	Pulse limiter	17/10/2020
285	1	Huber+Suhner	BNC Cable	0	Cable	Internal
407	1	Rohde & Schwarz	ESH3Z5	831887/019	LISN / AMN	24/05/2020
455	2	Schwarzbeck	8158	cat5-8158-0055	ISN	23/07/2021
679	2	Gauss	TDEIM30M	1510003	30MHz TD Receiver	10/04/2021
785	0	EH	Ground plane work area	0	0	Internal

CP = Interval period [year] prescribed for external calibrations

Note: 'Calibration due date' means that the instrument is certified with a UKAS or traceable calibration certificate.
'Internal' means internally calibrated using Eurofins Hursley procedures

3.6 Radiated Emissions

Initial Scan

A radiated profile scan was taken at a three metre distance on eight azimuths of the system under test in both vertical and horizontal polarities of the antenna in a semi-anechoic chamber. Instrumentation used in the chamber as below:

#ID	CP	Manufacturer	Type	Serial No	Description	Ext Calibration
047	3	Rohde & Schwarz	HFH2-Z2	879021/22	Loop antenna (9kHz-30MHz)	10/07/2022
053	1	HP	8449B	3008A01394	Pre-amplifier (1.0-26.5GHz)	17/10/2020
456	1	Rohde & Schwarz	ESCI7	1.145E+09	EMI Test Receiver	21/08/2020
466	3	Schwarzbeck	BBHA 9120 571	571	1-10GHz Horn	28/02/2022
651	1	Rohde & Schwarz	ESIB 40 no.2	100262	40GHz receiver	27/11/2020
750	1	Global	CISPR16 chamber	1	11 x 7 x 6.2m	28/10/2020
762	3	Schwarzbeck	VULB9162	129	30-7000MHz	07/07/2020
762a	3	Schwarzbeck	DGA 9552N	0	6dB attenuator for #762	07/07/2020

CP = Interval period [year] prescribed for external calibrations
Note: 'Calibration due date' means that the instrument is certified with a UKAS or traceable calibration certificate.
'Internal' means internally calibrated using Eurofins Hursley procedures

The data obtained from the profile scan was used as a guide for the final measurements.

Final Measurements

Final measurements of the system under test were also taken in the semi-anechoic chamber. The data obtained from the chamber profile-scan was used as a guide. Each emission identified from the EUT was maximised by revolving the system on the turntable and moving the antennae in azimuth. Above 30 MHz antenna height was adjusted to give maximum emission. The worst-case data is presented in this report. Test instrumentation used for final measurements is unchanged from the initial scan.

3.7 H field Emissions

Initial Scan

A radiated profile scan was taken at a three metre distance in a semi-anechoic chamber. Prescan measurements were made on eight azimuths of the system under test with the loop antenna oriented at 0 and 90 degrees to the EUT. Adjustments were made for the 3m measuring distance

Instrumentation used in the chamber as below:

#ID	CP	Manufacturer	Type	Serial No	Description	Ext Calibration
047	3	Rohde & Schwarz	HFH2-Z2	879021/22	Loop antenna (9kHz-30MHz)	10/07/2022
053	1	HP	8449B	3008A01394	Pre-amplifier (1.0-26.5GHz)	17/10/2020
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CP = Interval period [year] prescribed for external calibrations
Note: 'Calibration due date' means that the instrument is certified with a UKAS or traceable calibration certificate.
'Internal' means internally calibrated using Eurofins Hursley procedures

The data obtained from the profile scan was used as a guide for the final measurements.

Final Measurements

Final measurements of the system under test were also taken in the semi-anechoic chamber. The data obtained from the chamber profile-scan was used as a guide. Each emission identified from the EUT was maximised by revolving the system on the turntable and moving the antennae in azimuth. The worst-case data is presented in this report. Test instrumentation used for final measurements is unchanged from the initial scan.

4.0 TEST DATA

The EUT was tested for radiated and conducted disturbance measurements. The worst-case results are reported within this document.

4.1 Power Line Conducted Emissions; 0.15 to 30.0 MHz

A search was made of the frequency spectrum between 0.15 MHz to 30.0 MHz and the measurements reported here are the highest emissions relative to the CISPR Class B limits. Emissions that meet the average limit on a quasi-peak measurement are deemed to meet both the average and quasi-peak specification.

4.1.1 Data; RFID mode 110v 60Hz

MAINS – NEUTRAL

Frequency	Quasi-peak value (dBµV)			Average value (dBµV)			Status
	Measured	Class B Limit	Pass Margin	Measured	Class B Limit	Pass Margin	
531.673 kHz	36.37	56.00	19.63	35.17	46.00	10.83	Pass
5.352 MHz	28.67	60.00	31.33	23.65	50.00	26.35	Pass
13.559 MHz	44.51	60.00	15.49	43.32	50.00	6.68	Pass
15.910 MHz	27.94	60.00	32.06	23.04	50.00	26.96	Pass
24.917 MHz	28.43	60.00	31.57	23.63	50.00	26.37	Pass
27.120 MHz	32.47	60.00	27.53	29.01	50.00	20.99	Pass

MAINS – LINE

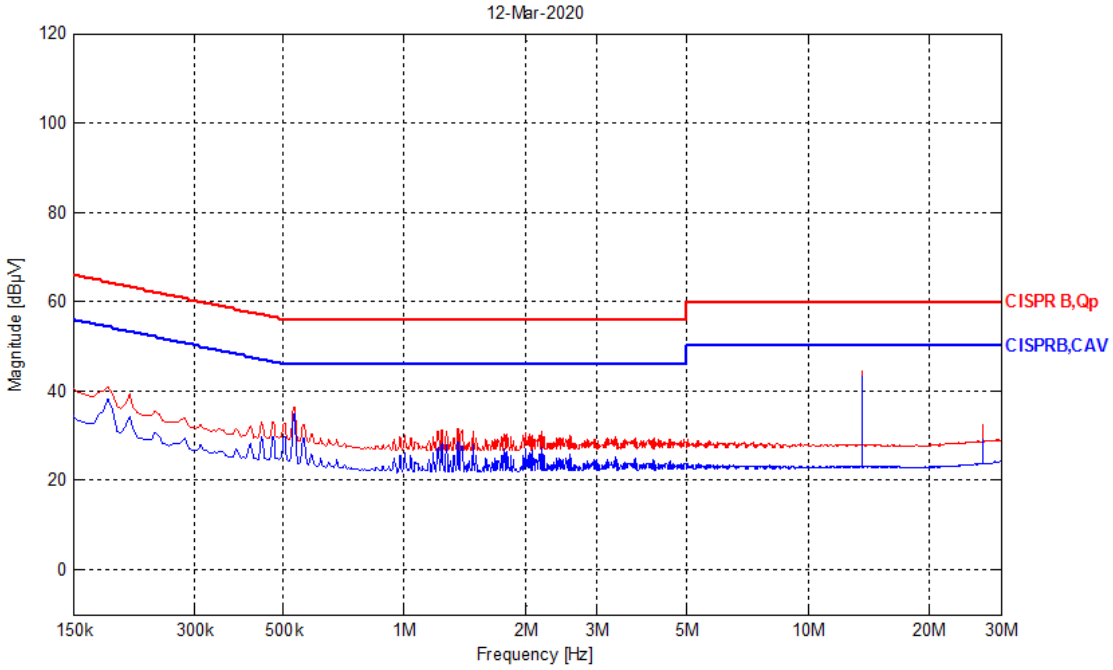
Frequency	Quasi-peak value (dBµV)			Average value (dBµV)			Status
	Measured	Class B Limit	Pass Margin	Measured	Class B Limit	Pass Margin	
531.673 kHz	36.38	56.00	19.62	34.98	46.00	11.02	Pass
5.186 MHz	28.74	60.00	31.26	23.71	50.00	26.29	Pass
13.559 MHz	43.01	60.00	16.99	41.75	50.00	8.25	Pass
17.416 MHz	27.96	60.00	32.04	23.04	50.00	26.96	Pass
24.998 MHz	28.41	60.00	31.59	23.62	50.00	26.38	Pass
27.120 MHz	31.14	60.00	28.86	27.21	50.00	22.79	Pass

Measurements made according to the FCC rules and Eurofins Hursley test procedure CON-02.

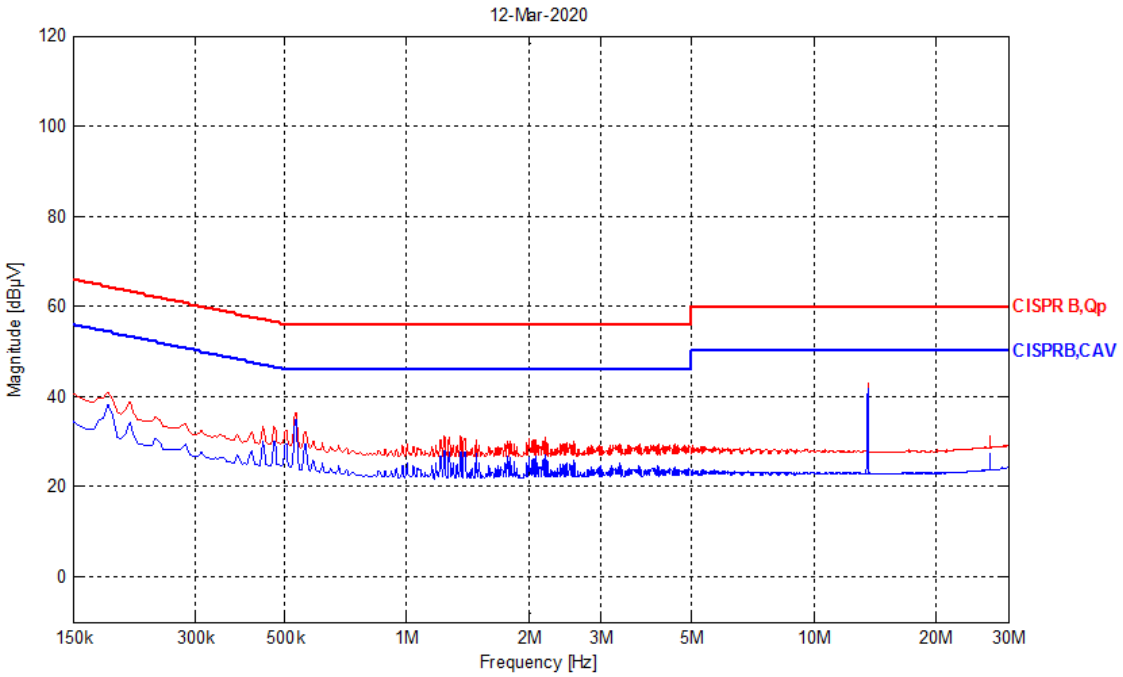
TEST ENGINEER: Richard Pennell

4.1.2 Profiles; RFID mode

Shown here is the Neutral profile.



Shown here is the Line profile.



4.2 Radiated Emissions 30MHz to 1GHz

Radiated emissions pre-scan profile measurements were taken at a distance of three metres on eight azimuths of the EUT in both horizontal and vertical antenna polarities in a semi anechoic chamber for FCC measurements.

Using the pre-scan results as a guide, each emission from the EUT was maximised. Measurements were carried out a distance of three metres in an ANSI C63.4 compliant semi-anechoic chamber. Cable positions were then finally adjusted to produce the maximum emission levels. Below 1 GHz a quasi-peak detector was used.

4.2.1.1 Data, RFID Mode

Frequency	Quasi Peak	Specified Limit	Margin	Height	Pol	Azimuth	Corr	
MHz	dBµV/m	dBµV/m	dB	cm	H/V	Deg	dB/m	Status
30.632318	32.29	40.00	7.71	105.0	V	338	16.8	Pass
37.530601	32.91	40.00	7.10	135.0	V	32	18.3	Pass
40.680933	39.46	40.00	0.54	106.0	V	3	19.4	Pass
43.804698	31.56	40.00	8.44	129.0	V	20	20.1	Pass
119.998990	37.52	43.50	5.98	284.0	H	266	16.9	Pass
249.987481	36.02	46.00	9.98	105.0	H	91	19.6	Pass

The measurements reported are the highest emissions relative to the:

‘FCC CFR 47 Section 15.209 and 15.249 Limits’ at a measuring distance of three metres.

‘ISED RSS-210 issue 10 Annex B section B10’

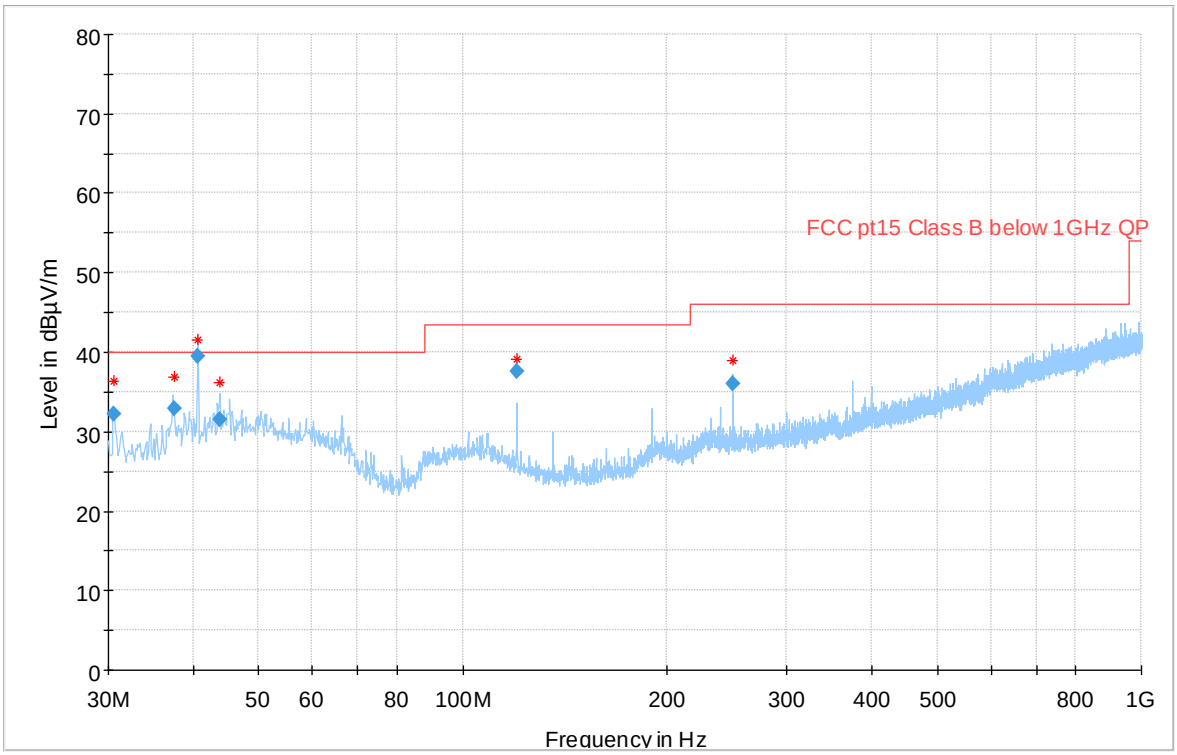
Measurements and take into account the antenna and cable loss factors and are made according to the FCC test standard and Eurofins Hursley test procedure RAD-01.

TEST ENGINEER: Richard Pennell

4.2.1.2 Profile; RFID Mode

Maximum peak hold trace with quasi-peak values (◆)

Peak measurements are shown in red (✳)



4.3 Radiated Emissions 1 to 8 GHz

Radiated emissions pre-scan profile measurements were taken at a distance of three metres on eight azimuths of the EUT in both horizontal and vertical antenna polarities in a semi anechoic chamber for FCC measurements.

Using the pre-scan results as a guide, each emission from the EUT was maximised. Measurements were carried out a distance of three metres in an ANSI C63.4 compliant semi-anechoic chamber. Cable positions were then finally adjusted to produce the maximum emission levels. The worst-case results are recorded below.

4.3.1.1 Data; RFID Mode

Frequency	Peak	Average	Limit	Margin	Height	Pol	Azimuth	Corr.	
MHz	dBµV/m	dBµV/m	dBµV/m	dB	cm	H/V	Deg	dB/m	Status
No significant peaks found									Pass

The Pk measurements were below the AV limit, so no need to make AV measurements.

The measurements reported take into account the antenna and cable loss factors. The measurements are the highest emissions relative to the:

'FCC CFR 47 Section 15.209 and 15.249 Limits' at a measuring distance of three metres.

'ISED RSS-210 issue 10 Annex B section B10'

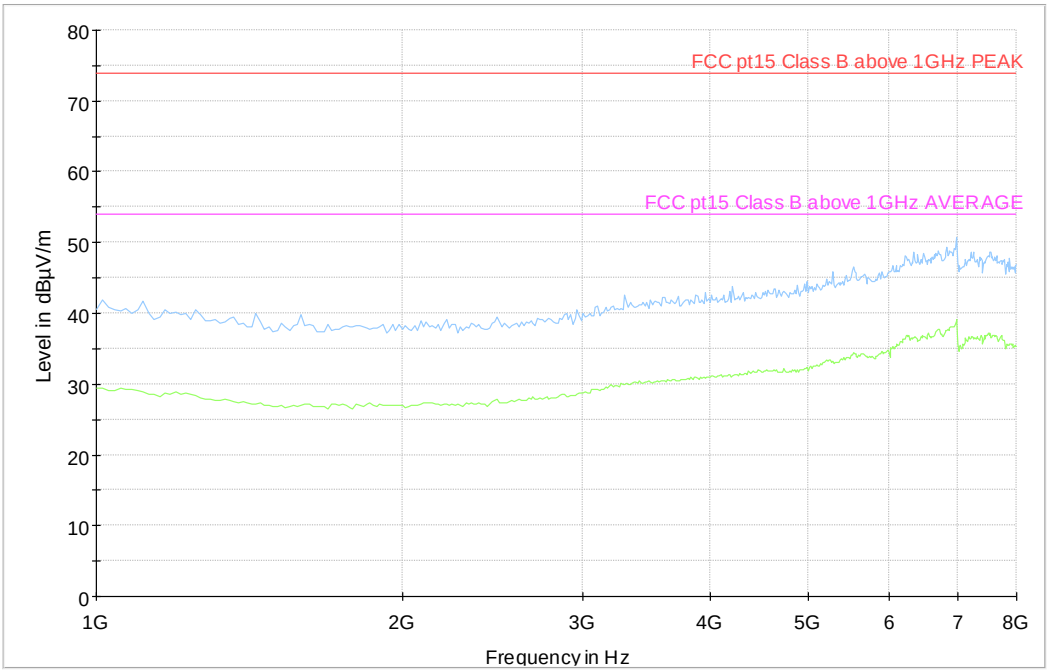
Measurements made according to the Eurofins Hursley test procedure RHF-01.
Procedure: In accordance with CISPR 22.

4.3.1.2 Profile; RFID Mode

Maximum peak hold trace with quasi-peak values (◆)

Peak measurements are shown in red (✳)

Average measurements are shown in green (◆)



4.4 FCC Pt15.225

4.4.1 FCC Pt15.225 e.

The carrier frequency was measured using a near filed probe and measuring receiver.

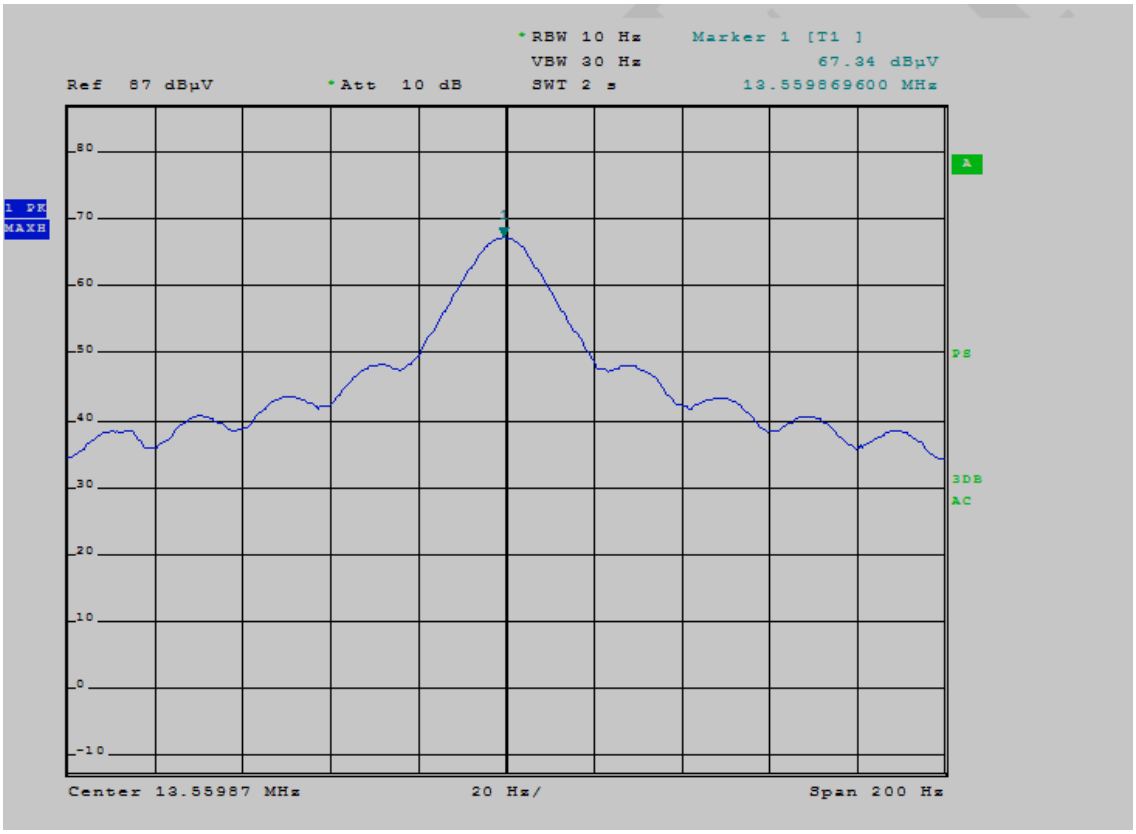
The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C

4.4.1.1 Data; Frequency tolerance +/-0.01%

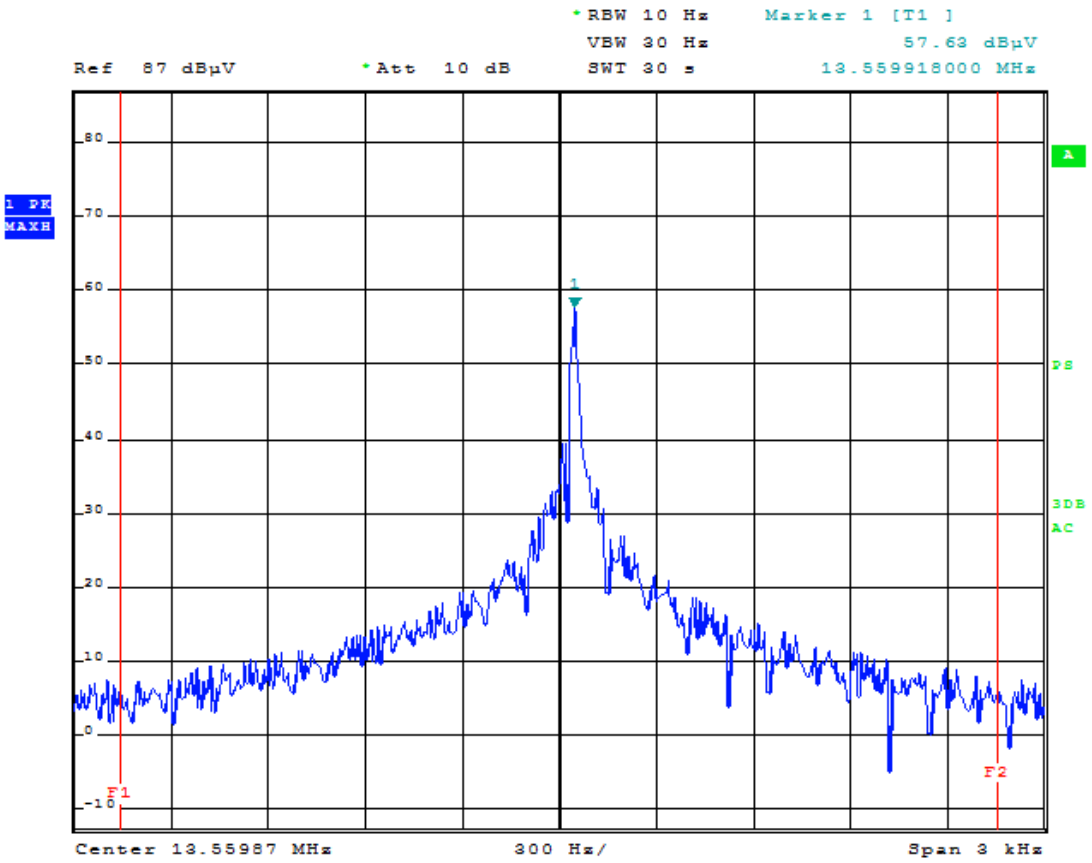
Temperature 20°C	Frequency (MHz)	Delta (Hz)	Delta %	Limit %	Status Pass / Fail
-20	13.559912	78	0.000575%	+/-0.01%	Pass
-10	13.559924	90	0.000664%	+/-0.01%	Pass
0	13.55993	96	0.000708%	+/-0.01%	Pass
10	13.559924	90	0.000664%	+/-0.01%	Pass
20	13.559834	Reference	N/A	N/A	N/A
30	13.559822	-12	-0.000088%	+/-0.01%	Pass
40	13.55981	-24	-0.000177%	+/-0.01%	Pass
50	13.559768	-66	-0.000487%	+/-0.01%	Pass

Mains Voltage at 20°C	Frequency (MHz)	Delta (Hz)	Delta %	Limit %	Status Pass / Fail
110v	13.559834	Reference	N/A	N/A	N/A
93.5v (85%)	13.559834	0	0%	+/-0.01%	Pass
126.5v (115%)	13.559834	0	0%	+/-0.01%	Pass

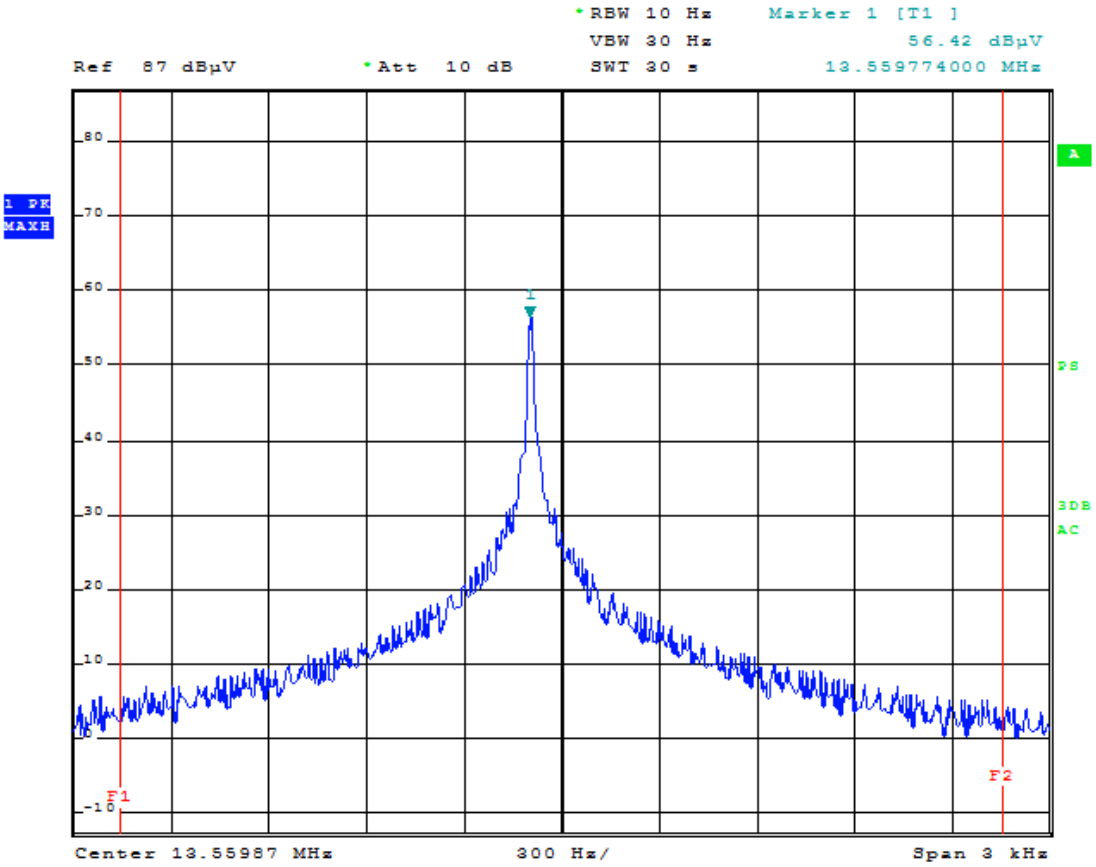
4.4.1.2 Profile; Nominal temperature and voltage



4.4.1.3 Profile; -20°C



4.4.1.4 Profile; +55°C



4.4.2 FCC Pt15.225 a, b, c, d & f. Field strength of emissions 9kHz to 30MHz

Radiated emissions pre-scan profile measurements were taken at a distance of three metres on eight azimuths of the EUT in both horizontal and vertical antenna polarities in a semi anechoic chamber for FCC measurements.

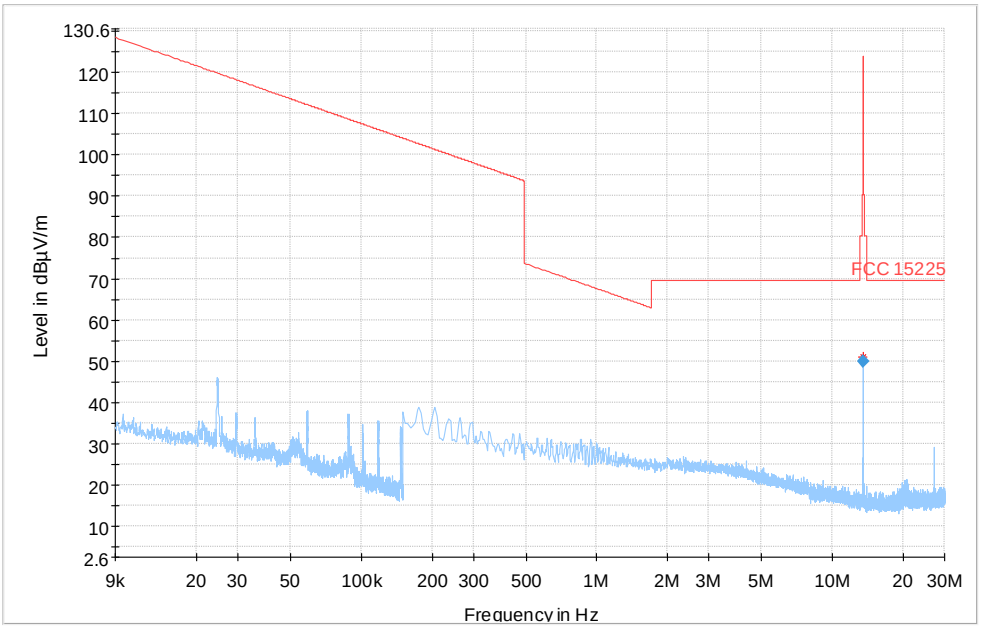
Using the pre-scan results as a guide, each emission from the EUT was maximised. Measurements were carried out a distance of three metres in an ANSI C63.4 compliant semi anechoic chamber. Cable positions were then finally adjusted to produce the maximum emission levels.

Below 1 GHz a quasi-peak detector was used. Testing was performed with the RFID activated. The worst-case results from all tests are presented here.

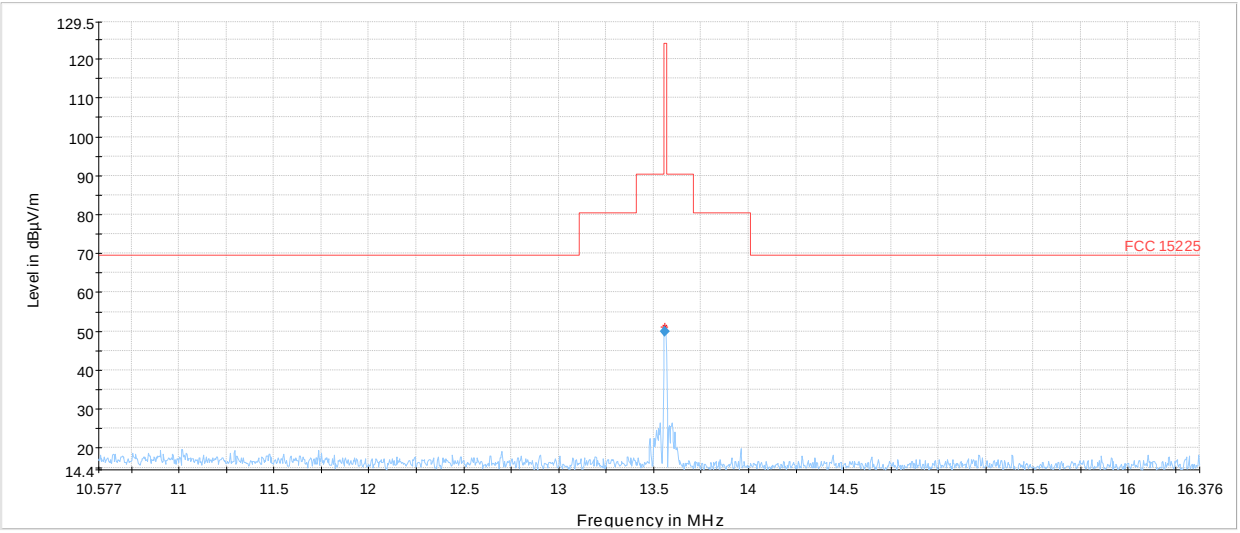
4.4.2.1 Data, RFID Mode

Frequency	Quasi Peak	Specified Limit	Margin	Height	Antenna orientation	EUT Azimut	Corr	
MHz	dBµV/m	dBµV/m	dB	cm	Deg	Deg	dB/m	Status
13.559944	49.95	124.00	74.05	100.0	0	104.0	19.8	Pass

4.4.2.2 Profiles; RFID Mode



4.4.2.3 Masked Profile; RFID Mode



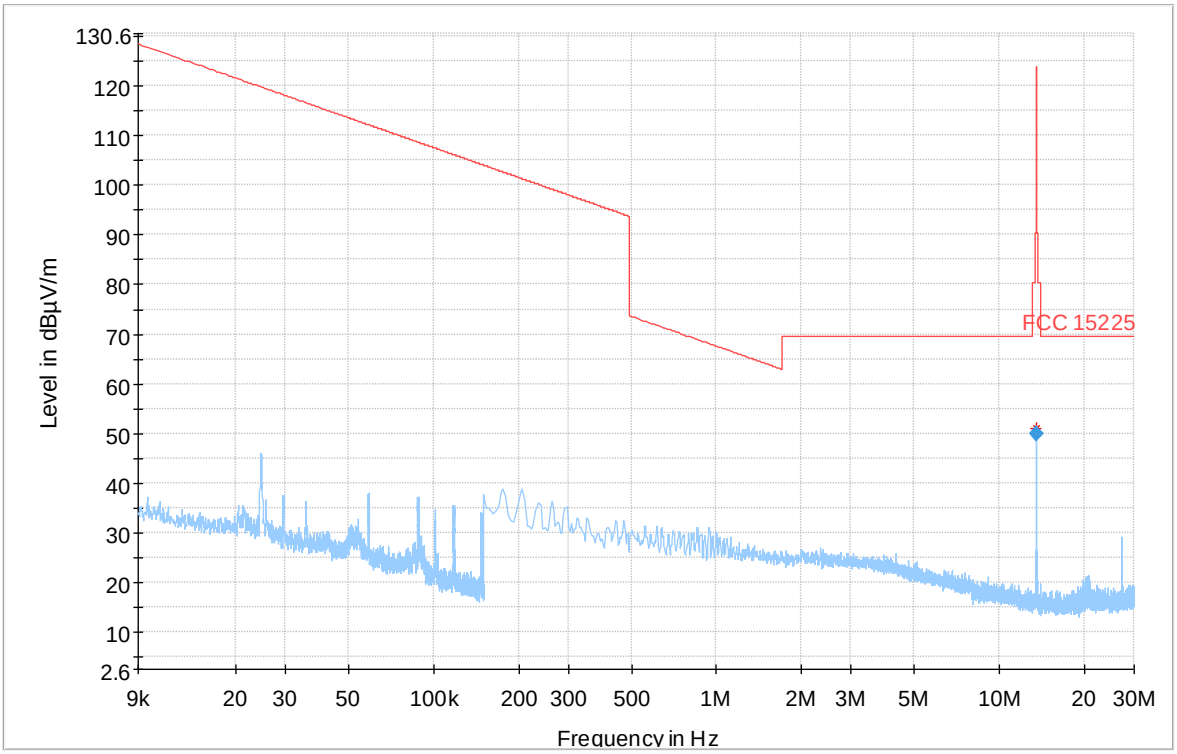
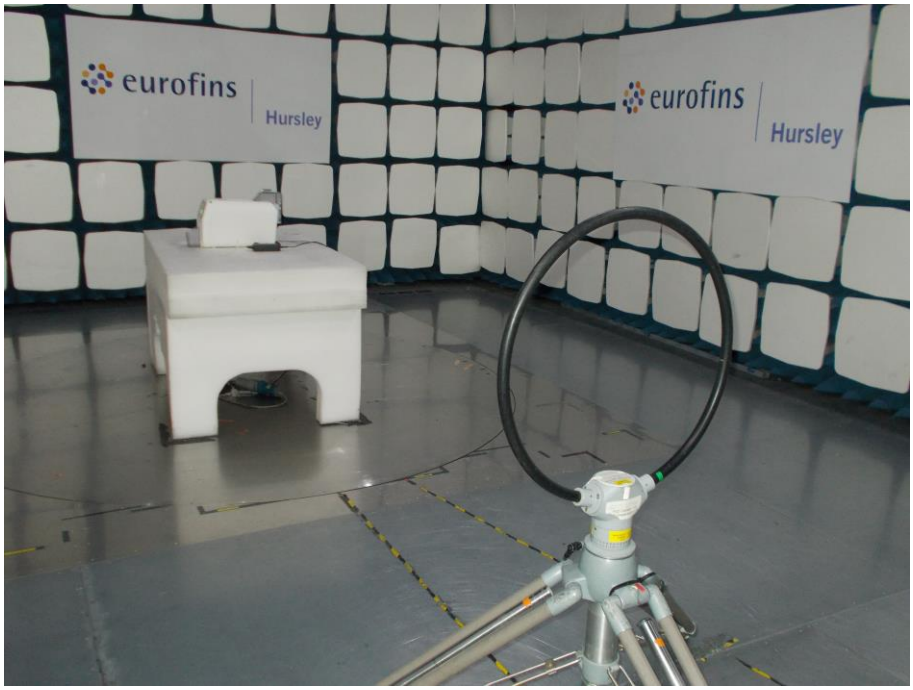


PHOTO LOG

Emissions:

Radiated emissions 9kHz to 30MHz



30MHz to 1GHz

Photo Log (continued)

Radiated emissions 1 to 8GHz

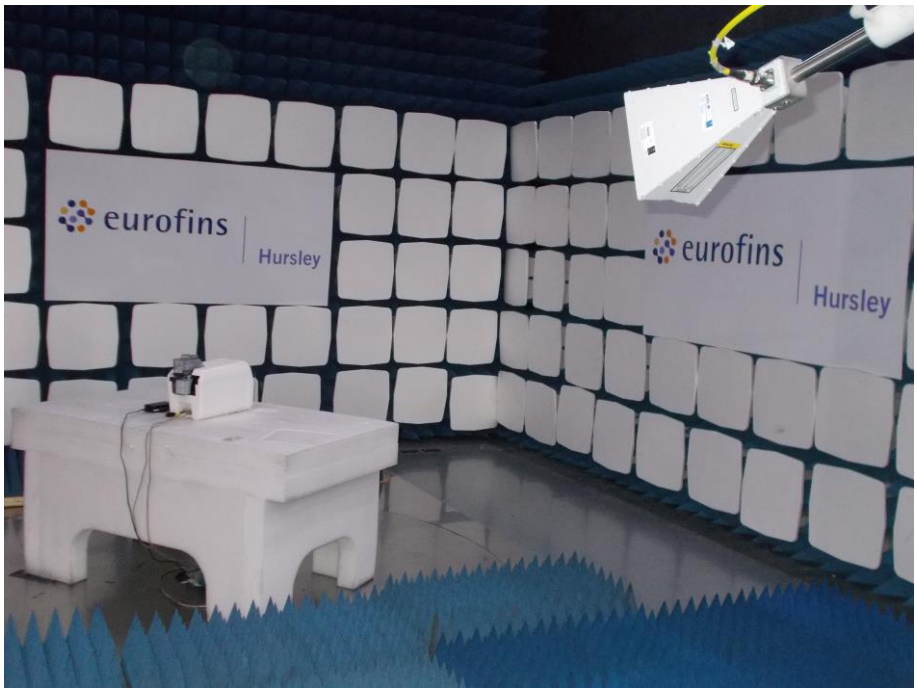
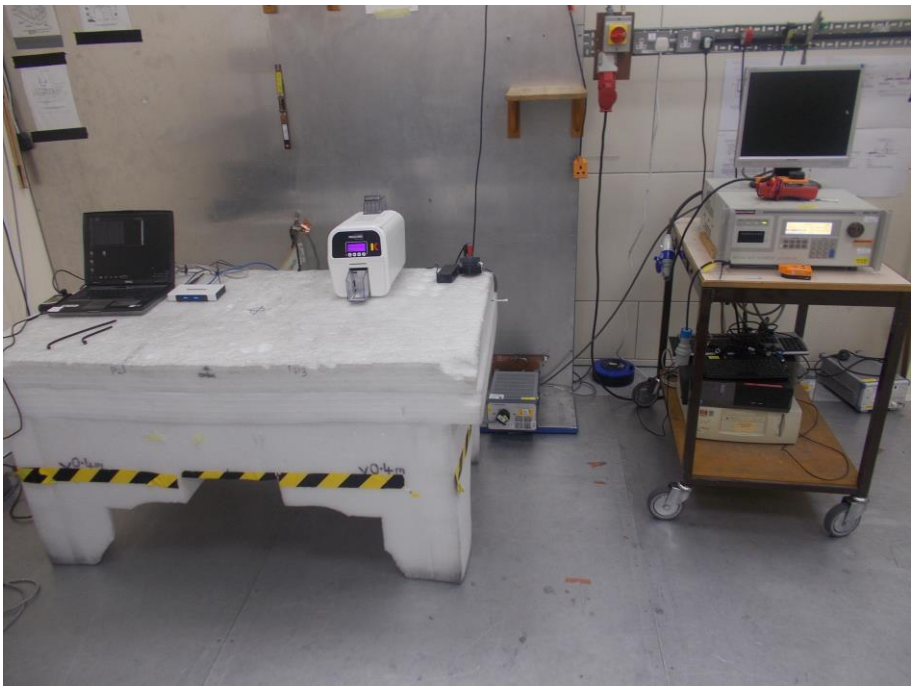


Photo Log (continued)

Conducted Measurements



15.225 temperature extreme Measurements

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